Elevator Movement Measurement Evaluation

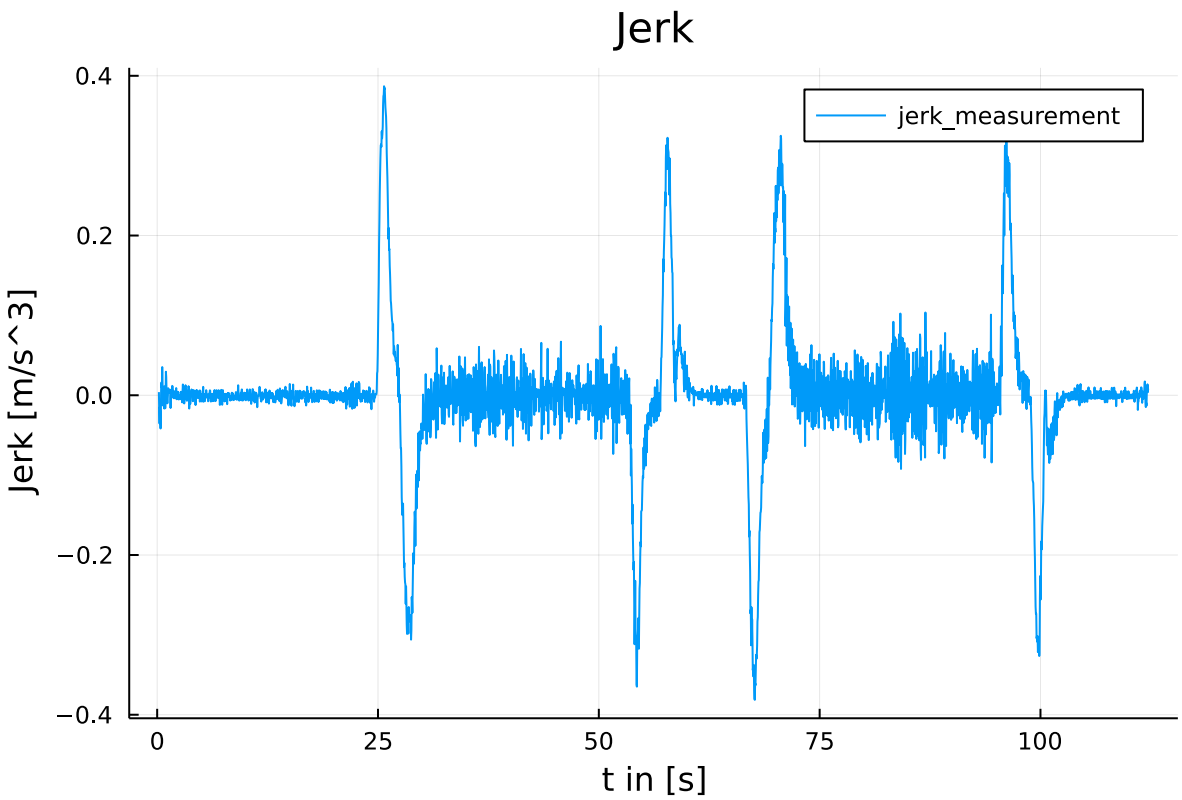
Imports and setup

In [ ]:
```
include("./main.jl")
using .Main
series = 1
data = read_data_series(series)
```

```
DataSeries(Accelerometer(Jerk([0.195417606, 0.233127449, 0.270837345, 0.308547189, 0.346257033, 0.383966928, 0.421676772, 0.4
59386616, 0.497096512, 0.534806356  …  111.8530416, 111.8907506, 111.9284596, 111.9661686, 112.0038776, 112.0415866, 112.0792
956, 112.1170046, 112.1547136, 112.1924226], [0.003936767578, -0.02130126953, -0.03543758392, -0.01453399658, -0.02175998688,
-0.0416021347, -0.01627349854, 0.0158662796, 0.0146818161, 0.009183883667  …  0.007238388062, -0.01111221313, -0.01482772827,
-0.009363174438, -0.01321220398, 0.005534172058, 0.005135536194, 0.01370239258, 0.003876686096, 0.008093833923], "jerk_measur
ement"), Acceleration(nothing, nothing, ""), Velocity(nothing, nothing, ""), Position(nothing, nothing, "")), PressureSensor
(Pressure([1.110390783, 2.110381356, 3.110382137, 4.110366251, 5.110386356, 6.110380314, 7.110386199, 8.110381824, 9.11037916
8, 10.11038448  …  102.3900408, 103.3900408, 104.3900408, 105.3900408, 106.3900408, 107.3900408, 108.3900408, 109.3900408, 11
0.3900408, 111.3900408], [1026.244995, 1026.597534, 1027.390015, 1026.244995, 1026.40625, 1026.44751, 1026.59375, 1026.43994
1, 1026.47876, 1026.443726  …  1026.436279, 1026.526245, 1026.5, 1026.621216, 1026.719971, 1026.548706, 1026.36499, 1026.4824
22, 1026.44873, 1026.361206], "pressure_measurement"), Position([1.110390783, 2.110381356, 3.110382137, 4.110366251, 5.110386
356, 6.110380314, 7.110386199, 8.110381824, 9.110379168, 10.11038448  …  102.3900408, 103.3900408, 104.3900408, 105.3900408,
106.3900408, 107.3900408, 108.3900408, 109.3900408, 110.3900408, 111.3900408], [0.0, -2.904567836, -9.430863913, 0.0, -1.3286
78533, -1.668616059, -2.873394284, -1.606261483, -1.92607617, -1.637438818  …  -1.576089781, -2.317282706, -2.101064967, -3.0
99651822, -3.91313288, -2.50232131, -0.9887299435, -1.956246861, -1.678673213, -0.9575506727], "altitude_measurement"), Veloc
ity([1.61038607, 2.610381746, 3.610374194, 4.610376304, 5.610383335, 6.610383257, 7.610384012, 8.610380496, 9.610381824, 10.6
1038469  …  102.8900408, 103.8900408, 104.8900408, 105.8900408, 106.8900408, 107.8900408, 108.8900408, 109.8900408, 110.89004
08, NaN], [-2.904595218, -6.52629098, 9.431013734, -1.328651821, -0.3399395791, -1.204771135, 1.267138345, -0.3198155362, 0.2
88635819, 0.1649391429  …  -0.7411929255, 0.2162177396, -0.9985868556, -0.8134810573, 1.410811569, 1.513591367, -0.967516917
9, 0.277573648, 0.7211225407, NaN], "velocity_measurement")))
```

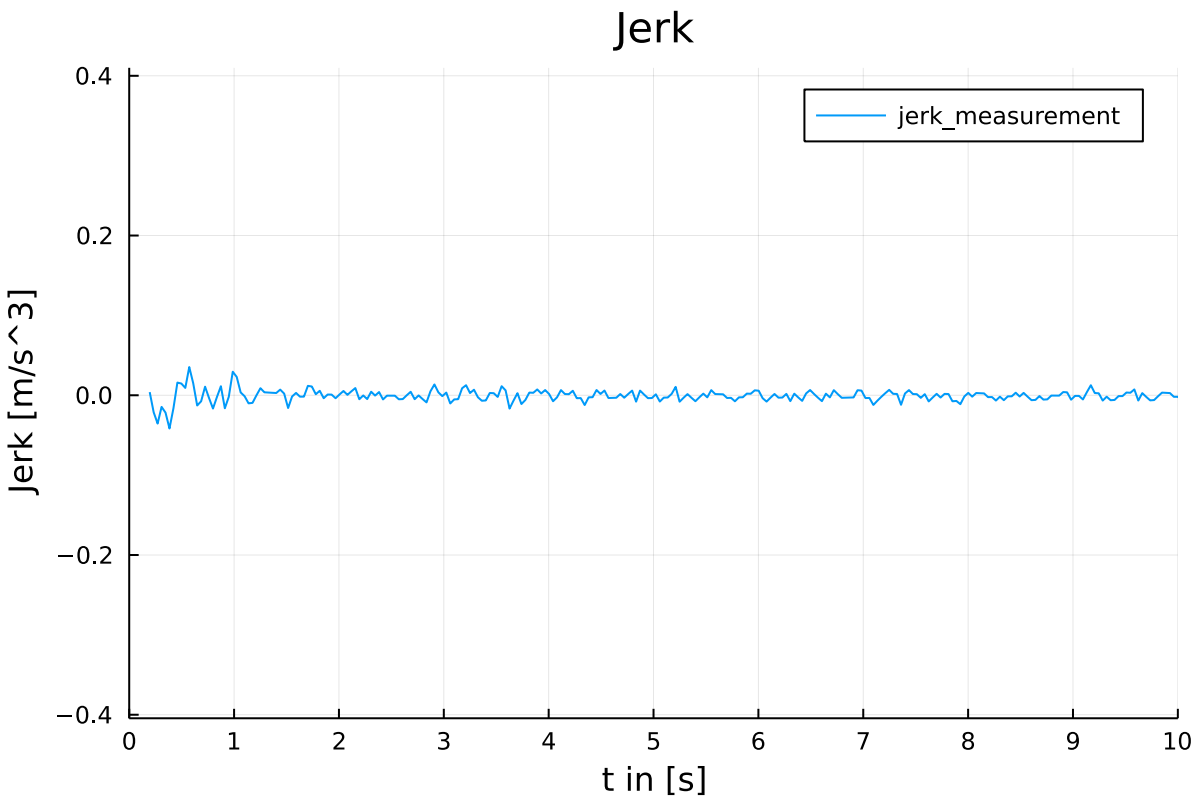
Plot of Raw Data

In [ ]:
```
plot_stuff(data.accelerometer.jerk)
save_figure("fig_plot_raw$(series)")
```



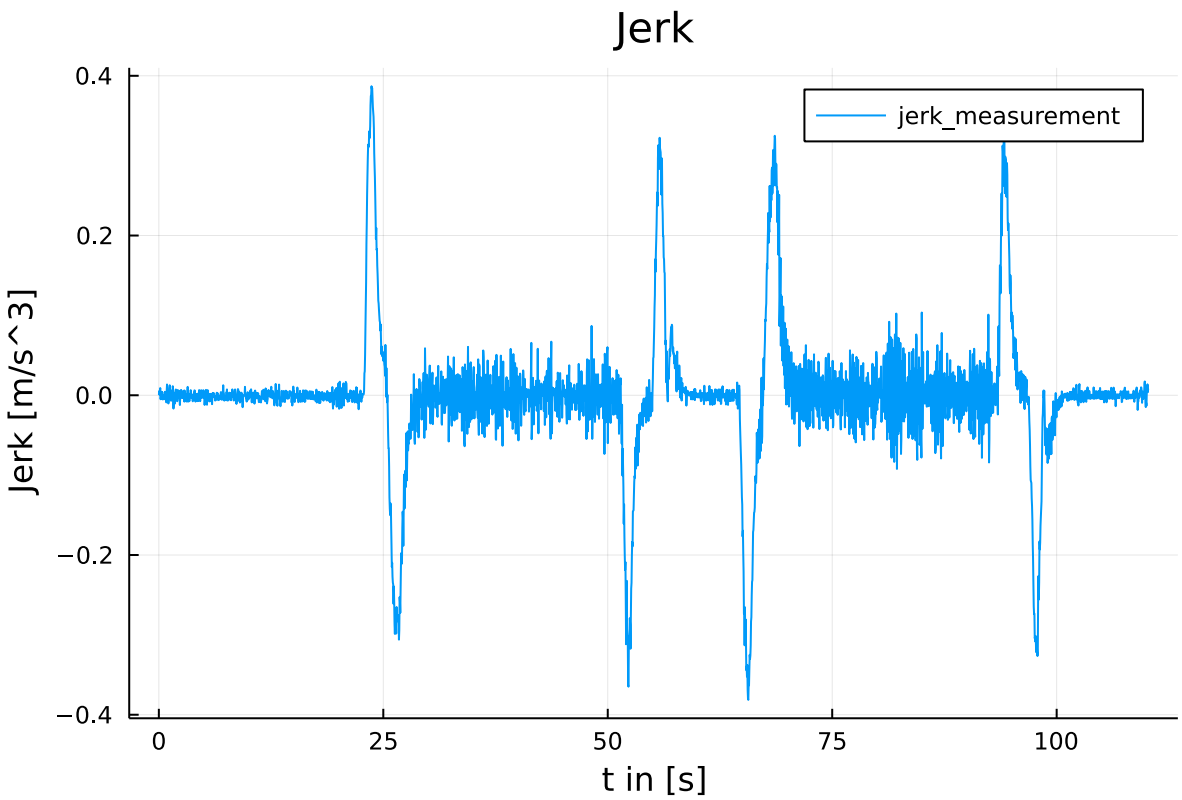
Zoom in on the first 10 seconds

In [ ]:
```
zoom_and_grid(0, 10)
```



Cut off access data (initial shaking of the phone)

In [ ]:
```
if series == 1
    cut(data, 0, 2)
end
plot_stuff(data.accelerometer.jerk)
```



Evaluate sensor noise and apply correction

In [ ]:
```
if series == 1
    offset = sensor_noise(data, (0, 20), (105, 110))
elseif series == 2
    offset = sensor_noise(data, (0, 15))
end
apply_offset(data, offset)
println("Offset: $offset")
```

```
Offset: -0.0006384369125840924
```

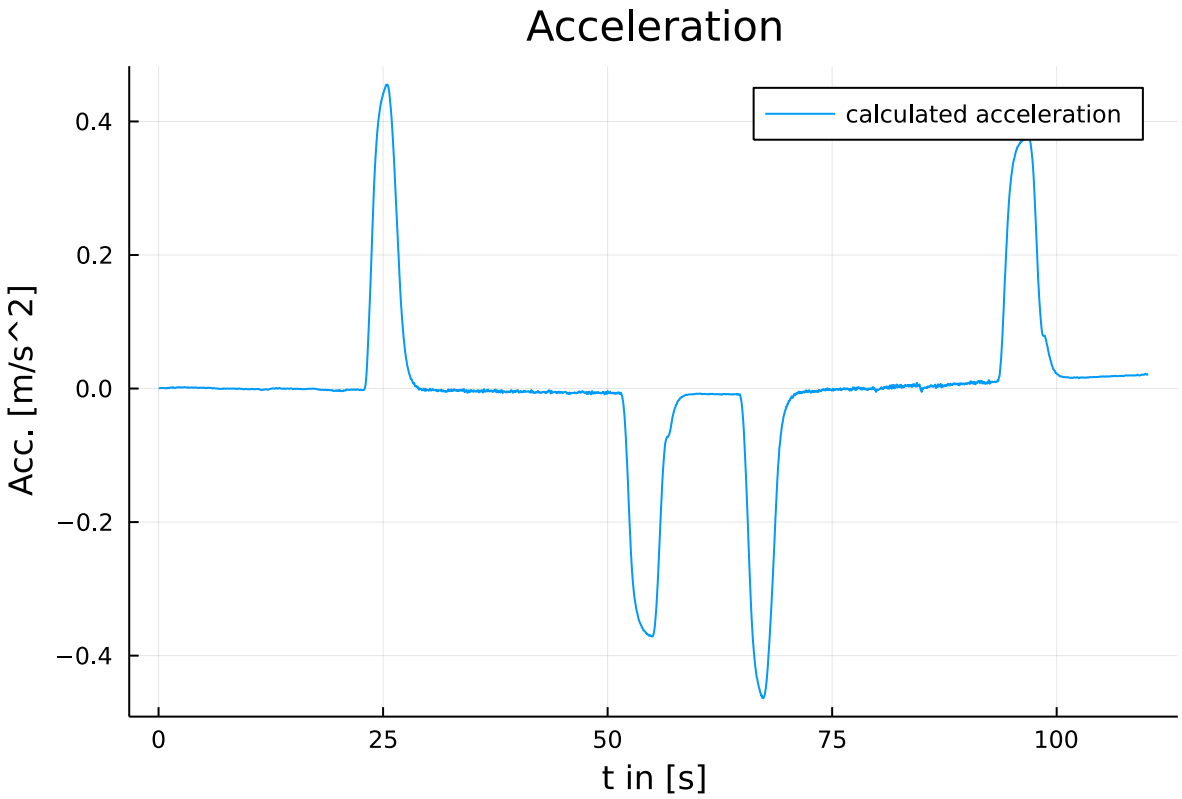
Integrate Data to get Acceleration, Velocity and Position

In [ ]:
```
integrate(data)
```

Display Results

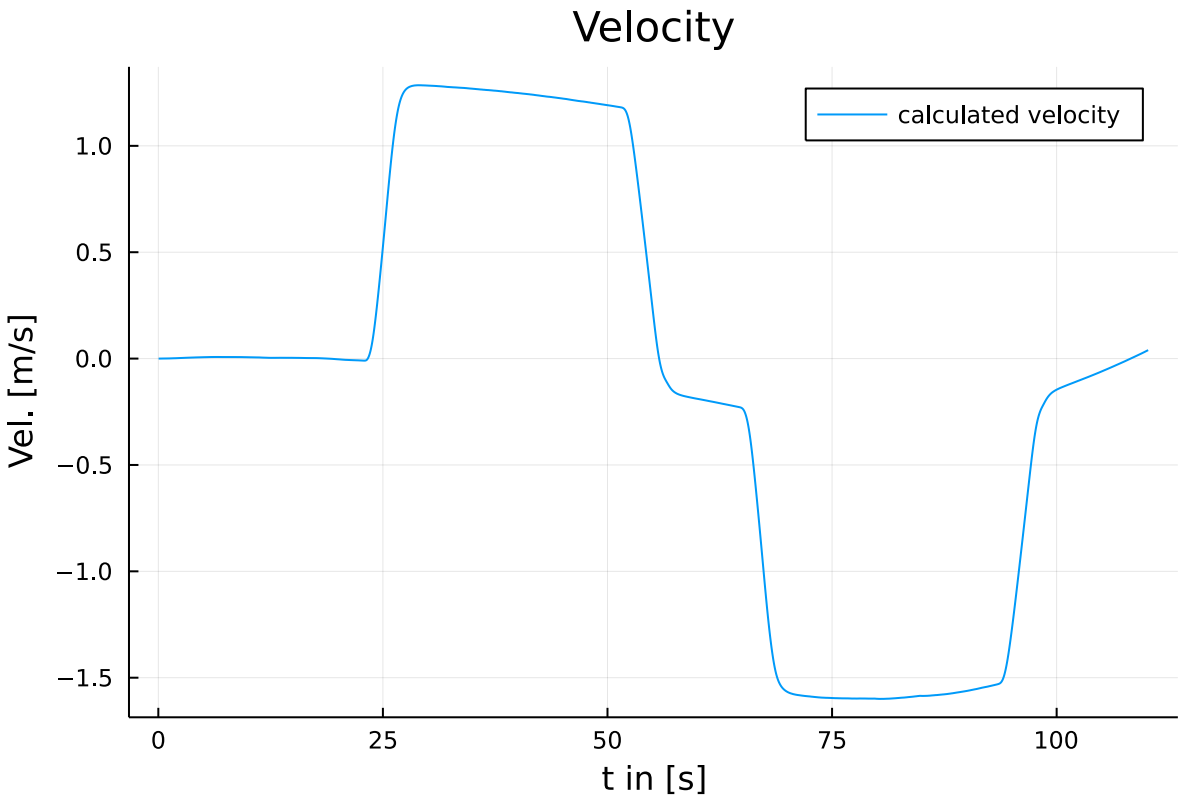
Acceleration by Accelerometer

In [ ]:
```
plot_stuff(data.accelerometer.acceleration)
save_figure("fig_plot_acc$(series)")
#zoom_and_grid(0, 110, 110/5)
```



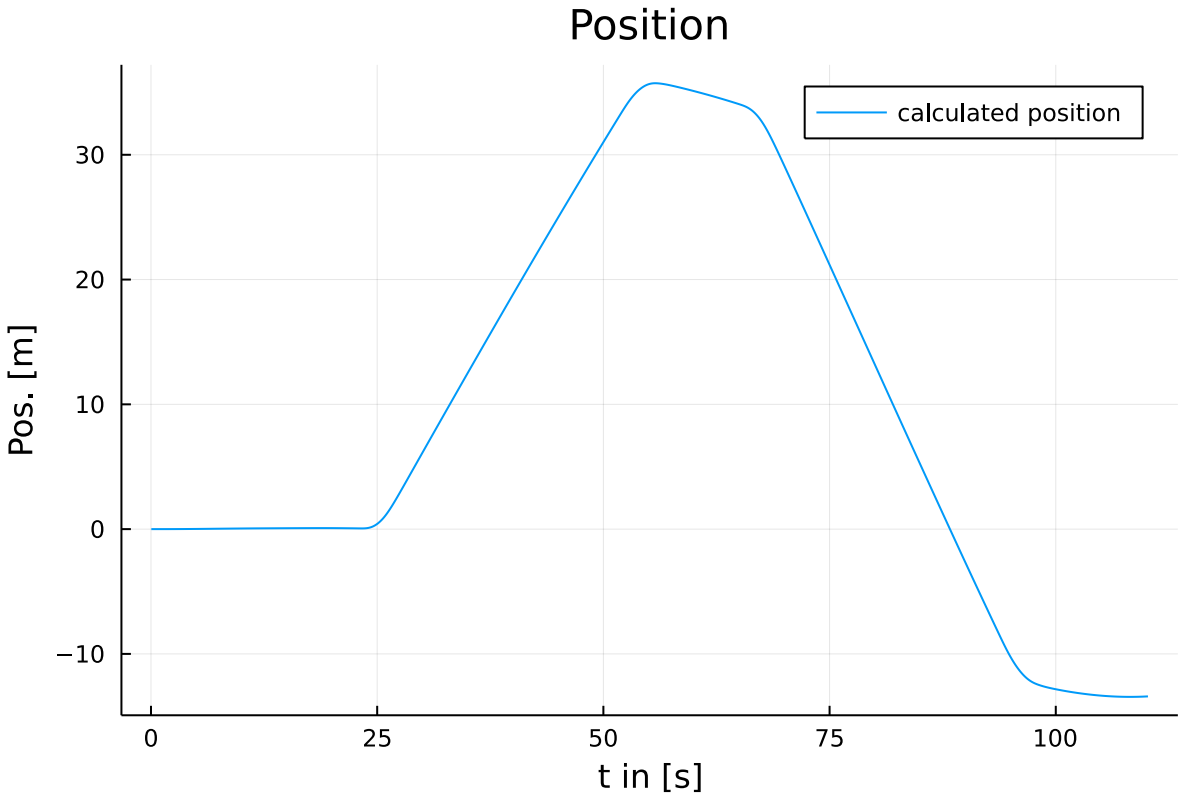
Velocity by Accelerometer

In [ ]:
```
plot_stuff(data.accelerometer.velocity)
save_figure("fig_plot_vel$(series)")
```



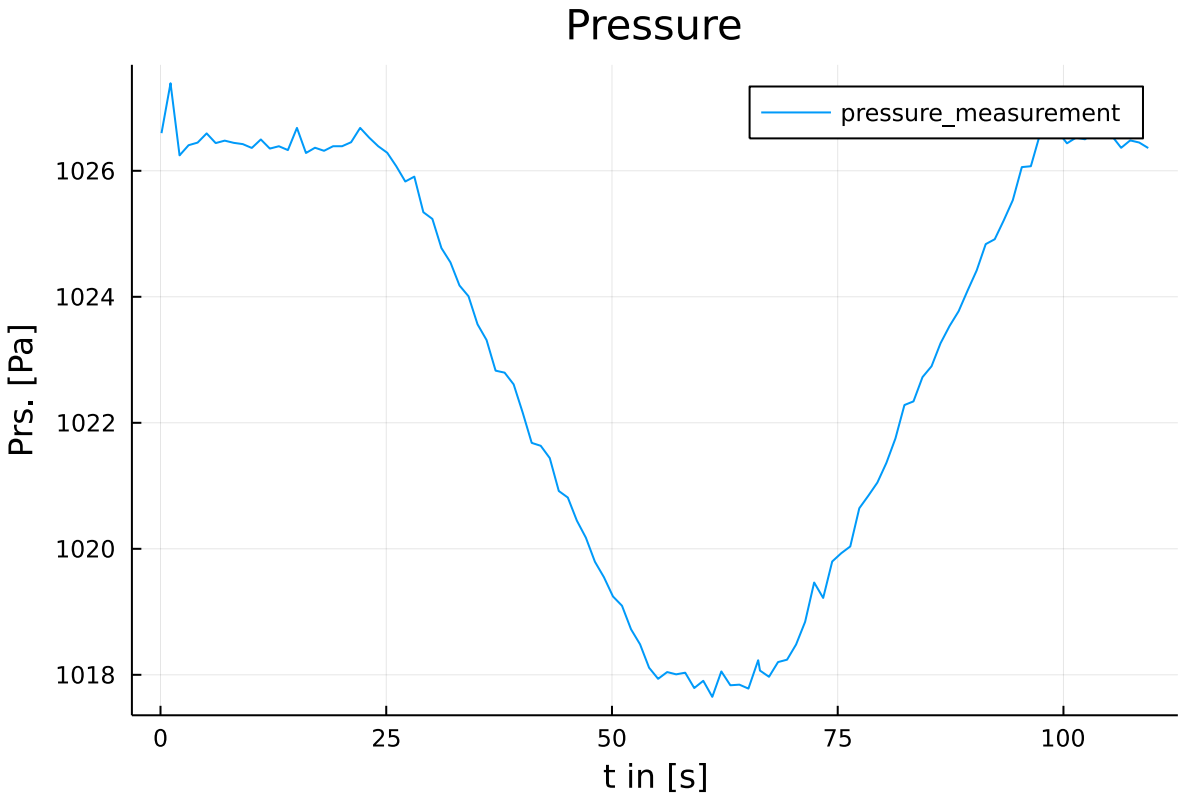
Position by Accelerometer

In [ ]:
```
plot_stuff(data.accelerometer.position)
```



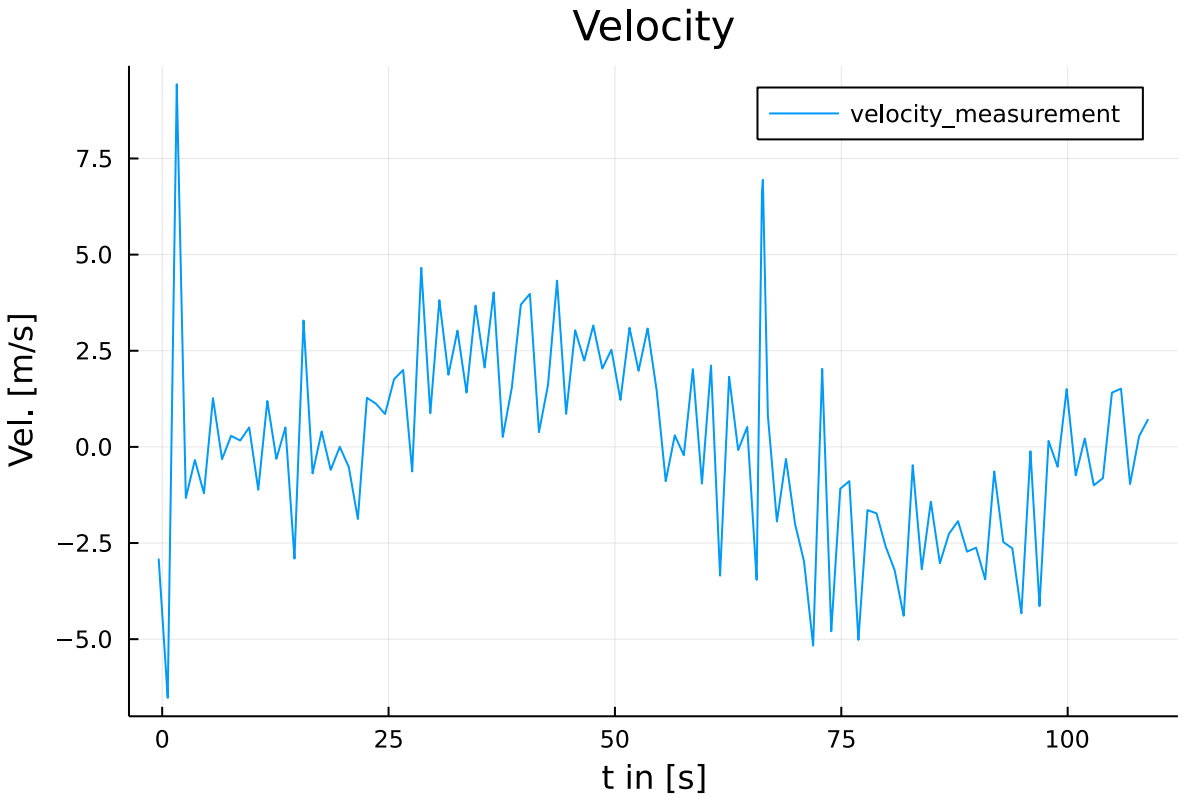
Pressure by Pressure Sensor

In [ ]:
```
plot_stuff(data.pressure_sensor.pressure)
save_figure("fig_plot_pressure$(series)")
```



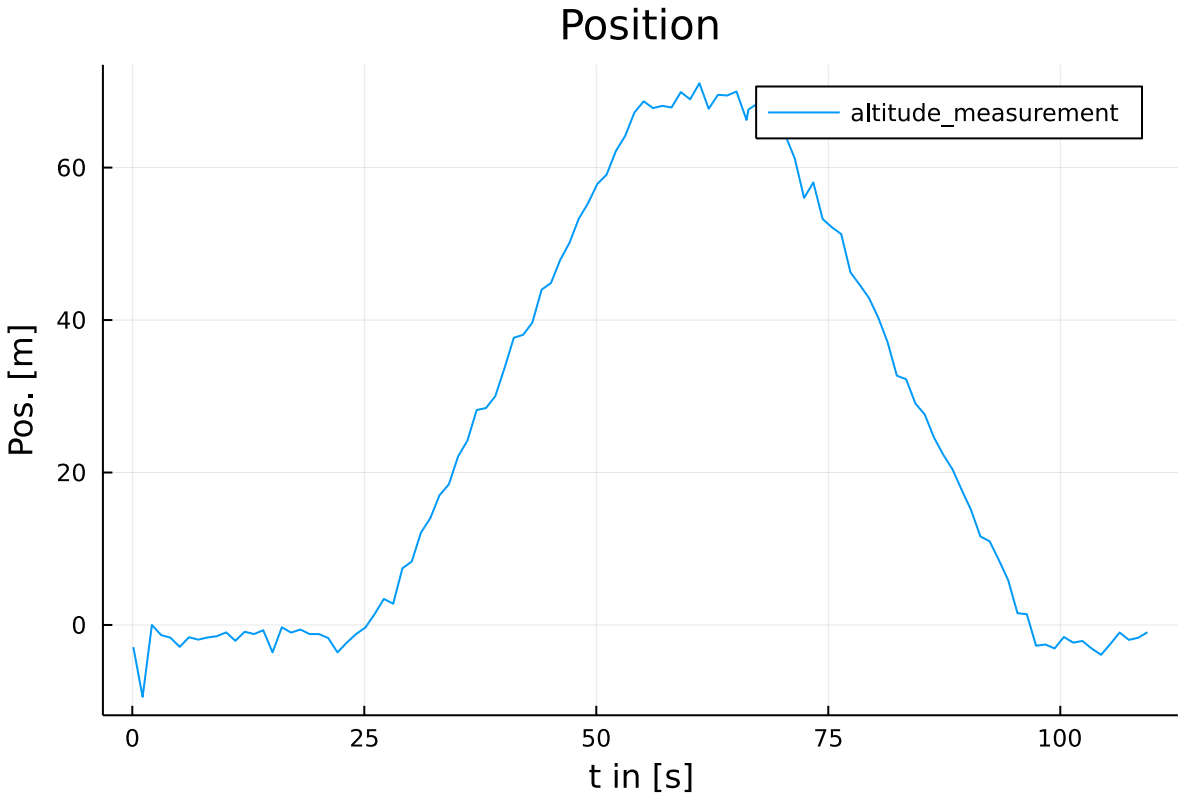
Velocity by Pressure Sensor

In [ ]:
```
plot_stuff(data.pressure_sensor.velocity)
```



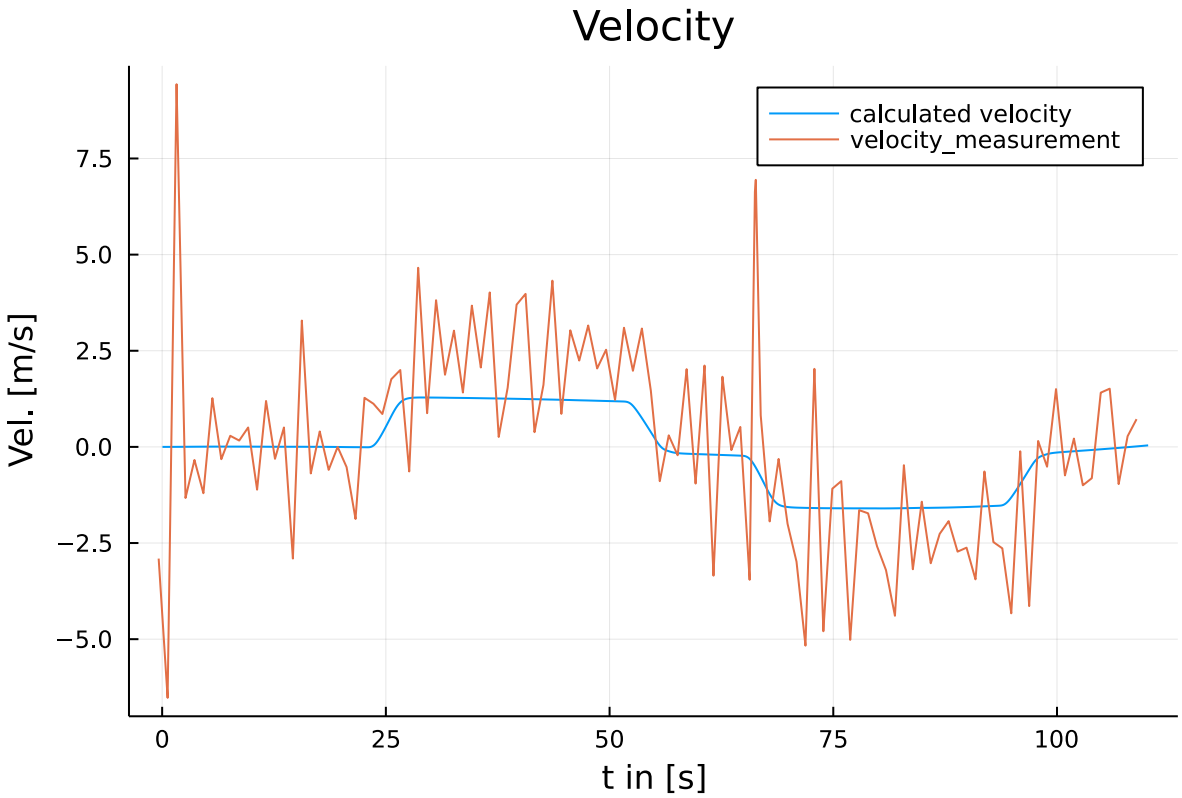
Position by Pressure Sensor

In [ ]:
```
plot_stuff(data.pressure_sensor.position)
```



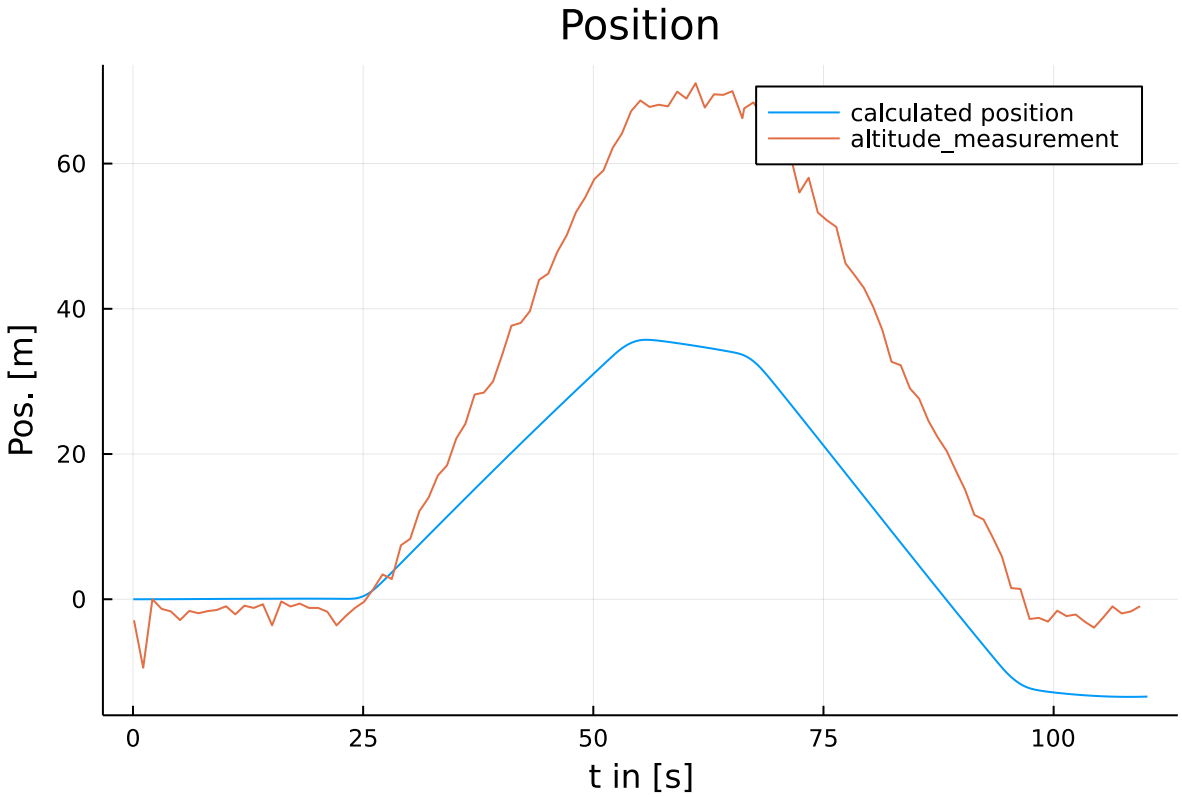
Velocity by Accelerometer and Pressure Sensor

In [ ]:
```
plot_stuff(data.accelerometer.velocity, data.pressure_sensor.velocity)
save_figure("fig_plot_vel_comp$(series)")
```



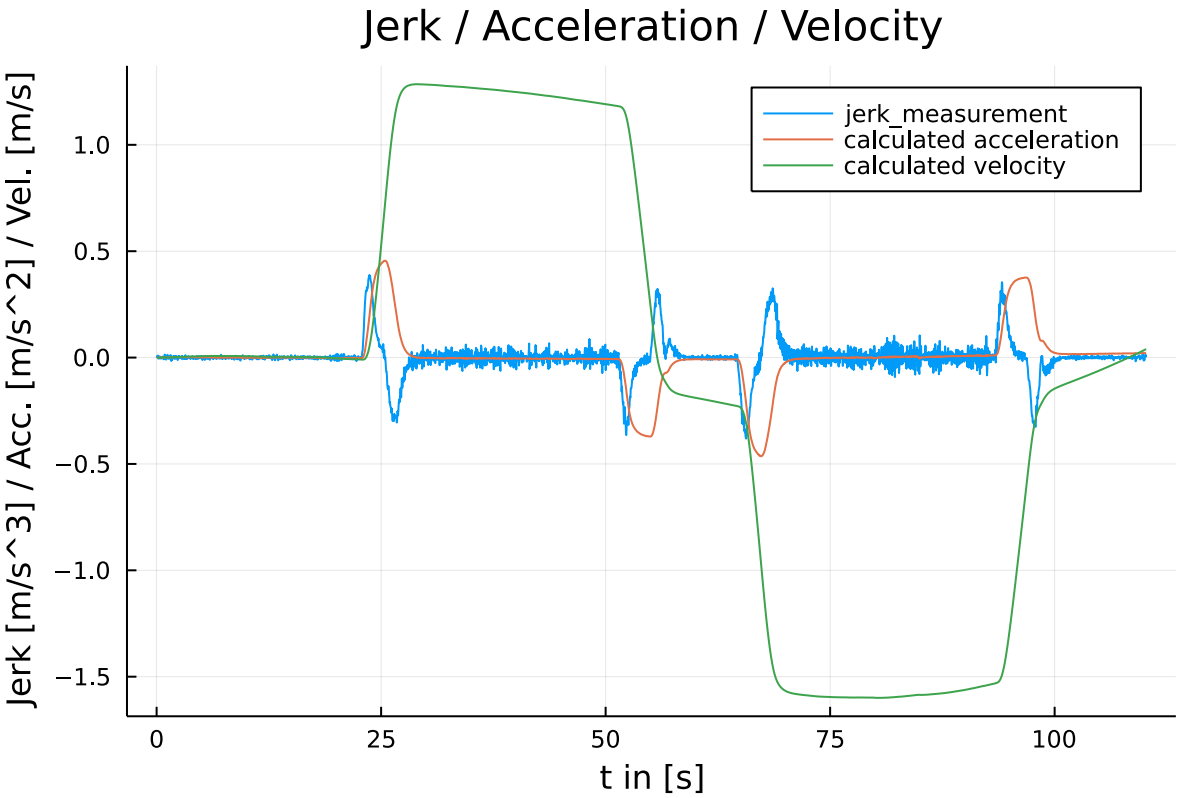
Position by Accelerometer and Pressure Sensor

In [ ]:
```
plot_stuff(data.accelerometer.position, data.pressure_sensor.position)
save_figure("fig_plot_pos_comp$(series)")
```



Acceleroemter: Jerk, Acceleration and Velocity

In [ ]:
```
plot_stuff(data.accelerometer.jerk, data.accelerometer.acceleration, data.accelerometer.velocity)
save_figure("fig_plot_acc_vel_jerk$(series)")
```



Evaluation of Results

In [ ]:

```
println("Maximum acceleration: $(maximum(data.accelerometer.acceleration.data)) m/s²")
println("Maximum ascending velocity: $(maximum(data.accelerometer.velocity.data)) m/s")
println("Maximum descending velocity: $(abs(minimum(data.accelerometer.velocity.data))) m/s")
println("Maximum position: $(maximum(data.accelerometer.position.data)) m")
```

```
Maximum acceleration: 0.45523983074183744 m/s²
Maximum ascending velocity: 1.2848812812551476 m/s
Maximum descending velocity: 1.5995496821371438 m/s
Maximum position: 35.7340938253742 m
```